THE FEEDING OF CROPS AND STOCK.

The Feeding of Crops and Stock. An Introduction to the Science of the Nutrition of Plants and Animals. By A. D. Hall, F.R.S. Pp. xvi+298. (London: John Murray, 1911.) Price 5*s.* net.

THIS volume is the third of a series by Mr. Hall dealing with some of the scientific aspects of farming, and, like the preceding treatises, on "The Soil" and "Manures and Fertilisers," gives an exceedingly clear and able exposition of the principles of crop and stock feeding, valuable alike to student, teacher, and practical farmer. It might be well if Mr. Hall would at a convenient time consider the rearrangement of the series, as at present there is some overlapping of subjects which is particularly noticeable in the present volume.

The first four chapters are devoted to the study of the growth of and the chemical changes occurring during the growth of plants. The important points in this process are illustrated by simple experiments which can be performed without the aid of complicated apparatus, and which we particularly commend to teachers of "nature-study" in our elementary and secondary schools. Chapters v. to viii. deal with matter which is more fully elaborated in Mr. Hall's work on "The Soil." Chapters ix. to xi. break fresh ground in dealing with the animal and its food requirements, whilst chapters xii. and xiii. are digests of Mr. Hall's treatise on "Fertilisers and Manures," the last chapter, xiv., containing a short account of the composition of milk and other dairy products.

The subject of the feeding of animals is one to which we could wish the author had devoted more space. Rothamsted has a wealth of results of its researches on the feeding of plants, but the subject of animal feeding has not received the same attention, though by this it must not be understood that extremely valuable work in that direction has not been accomplished, but it is a sad fact, appreciated by all workers in agricultural science, that in England we have no well-equipped station for the carrying on of necessary research in animal nutrition. The United States and Continental nations have seen the importance of such work, and the experimental work of these countries is rich in results, of which Mr. Hall has made excellent use, and we feel confident that had Rothamsted the equipment for such work which its reputation and the *personnel* of its present staff deserve, our knowledge of the feeding of animals would be greatly increased, to the benefit of the stock feeders of the country. Will not some friend of agriculture come forward and establish at Rothamsted a digestion calorimeter and endow its efficient service?

Mr. Hall has, in the work under review, disposed of many fallacies with regard to plant and animal nutrition, and we would commend to all practical men the pages dealing with the valuation of foods and the use of the various constituents of foods in the stages of fattening. (An omission in proof correction of the first few lines of p. 181 in speaking of the cottoncakes may give rise to some misunderstanding.) To the stock farmer it will be obvious that there is much in the book to interest, and if not to instruct him, at least to explain the principles on which his good practice depends, and to the arable farmer there is also much which, from the purely practical point of view, may show the way to economics in manuring by a well-reasoned explanation of the influence of manurial constituents on plants having differing range of root action, differing periods and durations of growth, and differing final products to build up. Such an important point as the quality of wheat is elaborated, with a due consideration of all the factors, and one-time accepted theory that the order of the evaluation of the protein and starch is the cause of the wide variations in quality between strong Canadian and weak English wheats is regarded as untenable.

As has been already stated. many formerly accepted theories are rejected, and sound reasons brought forward for their rejection, the reasons for crop rotations, the acid excretion by roots, the changes induced by ensiling, the use of preservatives for farmyard manure, effect of food on milk, are among many changes of opinion which have been brought about by accurate researches into cause and effect, and although the practical man is apt to be bewildered by these changes of opinion and to be somewhat sceptical as to the accuracy of present theories, the fault lies with those who have in the past hastily enunciated reasons without due consideration of all the factors, not to those who, like the author of this book, demand that a theory shall be not merely a plausible explanation of phenomena, but something which will rigorously satisfy all requirements, and the truth of which can be demonstrated by an appeal to accurate experiment.

M. J. R. D.

PATHOGENIC INSECTS.

Insects and Disease: a Popular Account of the Way in which Insects may Spread or Cause some of our Common Diseases. By Prof. R. W. Doane. Pp. xiv+227. (New York: H. Holt and Co.; London: Constable and Co., Ltd., 1910.) Price 1.50 dollars net.

IN this volume, which gives evidence of considerable research, Prof. Doane has presented the first collective narrative, in popular form, of the principal results which have been achieved in relation to insect-borne diseases, both in man and his domesticated animals. And in order that the layman may the more readily understand the biological relations of the various pathogenic organisms and their intermediary hosts, the author has briefly reviewed some of the more salient points in relation to their structure and life-history; in this way it is believed that the most complex inter-relations may be followed clearly.

Prof. Doane has met a great want in producing this unpretentious volume, in which he has successfully collated the overwhelming evidence of the maleficent agency of certain insects and other allied animals in the dissemination of disease. We feel, however, that he has been a little too credulous in some few instances in accepting evidence which is

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not of a thoroughly convincing nature, all the more so, seeing that the work is primarily intended for the layman, who has not the means of sifting out such matter and putting the correct interpretation upon it. Thus in dealing with Malta fever, in a few short sentences he would lead the reader to infer that mosquitoes often serve as the "inoculating" agents, and unfortunately leaves one entirely in the dark as to the true cause of the spread of this disease.

Many of the photographic illustrations which accompany this work are very good; indeed, more especially so are those representative of the various developmental stages of the mosquitoes; we do not agree with the author's statement, however, that all his pictures show "the insects, not as we think they should be, but as they actually are," because both colour values and general morphological characters are in many instances entirely wanting, and the resulting print is nothing more than a silhouette. Moreover, the photographs of both museum and microscopical preparations show a marked absence of care and neatness in the display of the various organs, and such figures as these stand out in marked contrast to those of Manson, Kellog, Nuttall, and others. We would point out also that Figs. 76 and 77 represent a female and male mosquito respectively, and not the reverse order, as stated by the author. *Ochromyia anthropophaga* (p. 49) should read *Auchmeromyia luteola.* The latter, not the former, is the parent of the congo-floor maggot.

This work is furnished with an extensive and useful bibliography occupying forty-seven pages, to which annotations are appended.

SYSTEMATICS.

Die taxonomischen Grenzen der Art und ihrer Unterabteilungen. Versuche einer genauen Definition der untersten systematischen Kategorien. By Andreas Semenov-Tian-Shansky. Pp. 24. (Berlin: R. Friedlaender and Son, 1910.) Price 2*s*.

THIS is the German translation of a pamphlet which appeared first in Russian. It deals on a wide basis with the definition of the term species and the lower categories in classification. The author —whose title, "Tian-Shansky," reminds us of his exploration of the Tian-shan or Celestial Mountains in Central Asia—pleads for uniformity of terminology in the various branches of botany and zoology, and then proceeds to examine critically the opinions of various botanists and zoologists on the criteria of species and its several component varieties. The large experience gained by Semenov from his many years' study of insects, especially Coleoptera, and his acquaintance with at least an essential portion of the literature bearing on the subject, enable him to substantiate his criticisms by illustrations drawn from his own knowledge and to adduce corroborative evidence from the writings of other authors. The co-existent species are defined by the author as units which are morphologically and psycho-physiologically separated from each other. The units thus isolated do not fuse, although very occasional intercrossing may occur. The individuals belonging to a species may all be practically alike, or they may form various kinds of varieties. Semenov defines four principal categories of modifications within a species:—

1. Subspecies or geographical race (*subspecies*) is the most important subdivision of a species, inasmuch as it represents a phylogenetic stage one degree below the complete separation from the parent stock.

2. Nation (*natio*) is a term proposed by Semenov for local varieties which are subdivisions of a subspecies, each *natio* occupying only a comparatively small definite portion of the whole area of the subspecies.

3. Morph (*morpha*) is adopted for the non-geographical varieties which are produced by the action of the seasons, the soil or the food.

4. Aberration (*aberratio*) is employed for purely individual deviations from the normal type.

It appears to us so very difficult and often impossible to draw in nature a distinction between subspecies and nation (=sub-subspecies) that in many cases the employment of one or the other term will entirely depend on the personal opinion of an author. The Greek term *morpha* does not appeal to us as a happy choice, and will hardly recommend itself to systematists generally, who are used to the Latin term *forma*, often employed with a convenient qualifying addition, such as *f. temp.*, for the seasonal form.

The pamphlet is a lucid interpretation of the distinguished author's view, and will be read with great profit by all who are interested in the philosophical aspect of systematics. K. J.

COORDINATE GEOMETRY.

An Elementary Treatise on Coordinate Geometry of Three Dimensions. By R. J. T. Bell. Pp. xvi+355. (London: Macmillan and Co., Ltd., 1910.) Price 10*s*. net.

THE substance of this volume has formed the material of a course of lectures delivered for some years past to undergraduates in Glasgow. Its object is to provide the student, whose bent is towards applied mathematics, with as complete an exposition of the subject as he will require, and at the same time to act as an introduction to those who intend to proceed to a more exhaustive study of differential geometry and the theory of surfaces. Its scope is best indicated by a brief enumeration of the headings of the chapters:—coordinates, direction ratios, the plane and straight line, change of axes, the sphere, the cone, the conicoids, axes of sections, generating lines, confocals, the general equation of the second degree, systems of conicoids, conoids and general surfaces, curves in space, ruled surfaces, curvature, geodesics. It will be noted that there is no mention of homogeneous and tangential coordinates. The author has excluded these on the ground that the student has already acquired a knowledge of the general principles involved from his work in plane geometry. The same consideration has led him to exclude any section on dualitv or reciprocation. Some teachers will regret this omission, as the student is

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